LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)

Operating Systems Lab Manual
II Year II Semester (R20)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Vision of the Department

The Computer Science & Engineering aims at providing continuously stimulating educational environment to its students for attaining their professional goals and meet the global challenges.

Mission of the Department

- **DM1:** To develop a strong theoretical and practical background across the computer science discipline with an emphasis on problem solving.
- **DM2:** To inculcate professional behaviour with strong ethical values, leadership qualities, innovative thinking and analytical abilities into the student.
- **DM3:** Expose the students to cutting edge technologies which enhance their employability and knowledge.
- **DM4:** Facilitate the faculty to keep track of latest developments in their research areas and encourage the faculty to foster the healthy interaction with industry.

Program Educational Objectives (PEOs)

- **PEO1:** Pursue higher education, entrepreneurship and research to compete at global level.
- **PEO2:** Design and develop products innovatively in computer science and engineering and in other allied fields.
- **PEO3:** Function effectively as individuals and as members of a team in the conduct of interdisciplinary projects; and even at all the levels with ethics and necessary attitude.
- **PEO4:** Serve ever-changing needs of society with a pragmatic perception.

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in

	diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

1. **Pre-requisites:** Knowledge of basic Computer hardware & software.

2. **Course Educational Objectives (CEOs):**

In this course student will learn about

The objective of this lab is to provide the various UNIX/Linux operating system commands, importance of System calls, Scheduling algorithms and Memory Management techniques.

3. **Course Outcomes (COs):** At the end of the course, the student will be able to:

CO1: Experiment with Unix commands and shell programming (Understand- L2)
CO2: Implement CPU scheduling algorithms and memory management Techniques (Apply- L3)
CO3: Simulate process synchronization and file system management using system calls (Apply - L3).
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

4. **Course Articulation Matrix:**

Course Code	COs	Programme Outcomes												PSOs		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
20CS59	CO1	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	CO2	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-
	CO3	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-
	CO4	-	-	-	-	-	-	-	2	2	2	-	-	-	-	-
1 = Slight (Low) 2 = Moderate (Medium) 3-Substantial(High)																

List of programs

Cycle-1:

Execute various UNIX system calls

1. Process Management
2. File Management
3. Input/Output System Calls

Cycle-2:

Simulate the following CPU scheduling algorithms.

a) FCFS b) SJF c) Round Robin d) Priority.

Cycle-3:

Simulate the file allocation strategies:

a) Sequential b) indexed c) Linked

Cycle-4:

Simulate MVT and MFT

simulate contiguous memory allocation techniques

a) Worst-fit b) Best fit c) First fit

Cycle-5:

Simulate all File Organization techniques

A) Single level directory b) Two level c)Hierarchical d)DAG

Cycle-6:

Simulate Bankers Algorithm for Deadlock Avoidance

Simulate Bankers algorithm for Deadlock Prevention

Cycle-7:

Simulate disk scheduling algorithms.

a) FCFS b) SCAN c) C-SCAN

Cycle-8:

Programs on process creation and synchronization, inter process communication Including shared memory , pipes and and messages. (Dinning - Philosopher problem).

Cycle-1: Execute various UNIX system calls

---

1)Process Management system calls

a) Aim: To write C programs to simulate UNIX command fork()

Program:

```
#include<stdio.h>
#include<sys/types.h>
main()
 {    int pid;
    pid=fork();
   if(pid==0)
{
printf("\n I am the child");
printf("\n I am the parent :%d",getppid());
         printf("\n I am the child :%d",getpid());
}
else
{
 printf("\n I am the parent ");
 printf("\n I am the parents parent :%d",getppid());
printf("\n I am the parent :%d\n",getpid());
   }
}
```

Output:

```
I am the child
I am the  parent:  3944
I am the child:  3945
I am the parent
I am the parents parent:  3211
I am the parent:  3944
```

b) Aim: To write C programs to simulate UNIX command execv()

Program:

```
#include<stdio.h>
 #include<unistd.h>
 main()
{
 char *temp[3];
temp[0]="ls";
temp[1]="-l";
temp[2]=(char *)0;
execv("/bin/ls",temp);
printf("this will not print\n");
}
```

Output:

```
total 76
-rwxr-xr-x    1 be322    group     4716 Mar 7 10:13  a.out
-rw-r--r--    1 be322    group      688 Feb 20  13:52  comm.c
-rw-r--r--    1 be322    group      925 Feb 20  13:54  echomsg.c
-rw-r--r--    1 be322    group      722 Feb 20  13:55  echopipe.c
-rw-r--r--    1 be322    group      178 Feb 20  13:57  exel.c
-rw-r--r--    1 be322    group      167 Mar 7   10:13  exev.c
-rw-r--r--    1 be322    group     1109 Feb 20 13:57  fflag.c
-rw-r--r--    1 be322    group      341 Dec 26  14:47  frk.c
-rw-r--r--    1 be322    group      140 Feb 20  13:57  linearg.c
-rw-r--r--    1 be322    group      528 Feb 20  13:57  lock.c
-rw-r--r--    1 be322    group      254 Feb 20  13:57  msg.c
-rw-r--r--    1 be322    group     1036 Feb 20 13:57  msgpass.c
-rw-r--r--    1 be322    group      203 Feb 20  13:58  sem.c
-rw-r--r--    1 be322    group     1167 Feb 20 13:58  sharememory.c
-rw-r--r--    1 be322    group      312 Feb 20  13:58  slp.c
-rw-r--r--    1 be322    group     1182 Feb 20 13:58  threadf.c
-rw-r--r--    1 be322    group      287 Feb 20  13:59  wt.c
```

c) Aim: To write C programs to simulate UNIX command execlp()

Program:

```
#include<stdio.h>
#include<sys/types.
h>
main()
 {
   int pid;
    pid=fork();
     if(pid==0)
    {
         printf("\n fork program started");
         execlp("/bin/ls","ls",NULL);
     }
else
    {
         printf("\nend");
    }
}
```

OUTPUT:

```
end$
 fork program started a.out
comm.c
echomsg.c
echopipe.c
exel.c exev.c
fflag.c frk.c
linearg.c
lock.c msg.c
msgpass.c
sem.c
sharememory.c
slp.c threadf.c
wt.c
```

d) Aim: To write C programs to simulate UNIX command wait()

Program:

```
#include<unistd.h>
 #include<stdio.h>
 main()
{
int i=0,pid;
 pid=fork();
 if(pid==0)
        {
         printf("child  process started\n");
                for(i=0;i<10;i++)
                 printf("\n%d",i);
                 printf("\n child process
                ends");
        }
         else
        {
        printf("\n parent process starts");
         wait(0);
        printf("\n parent process ends");
        }
}
```

Output:

```
parent process starts
 child  process started

0
1
2
3
4
5
6
7
8 9  child process
ends
 parent process ends
```

e) Aim: To write C programs to simulate UNIX command sleep()

Program :

```
#include<unistd.h>
#include<stdio.h>
main()
{
int i=0,pid;
        printf("\n ready for
        fork\n");
        pid=fork(); if(pid==0)
        {
        printf("\n child process started \n");
        sleep(4);
        for(i=0;i<10;i++)
         printf("\n%d",i);
        printf("\n child process ends");
        }
        else
        {
        printf("\n I am the parent");
        printf("\n parent process ends");
        }
}
```

Output:

```
ready for fork
 I am the parent
parent process
ends
child process started

0
1
2
3
4
5
6
7
8 9
 child process ends
```

2)File Management System calls or I/O System calls

a) Aim: To write C programs to simulate UNIX command pipe()

Program :

```
#include<stdio.h>

#include<unistd.h>

#include<sys/ipc.h>

#include<sys/types.h>

 #define msgsize 16

main()

    {
    char *msg="hello world";
     char inbuff[msgsize];
    int p[2],pid,j;
    pipe(p);
     pid=fork();
    if(pid>0)
        {

        close(p[0]);

         write(p[1],msg,msgsize);

        }

        if(pid==0)

        {

        close(p[1]);

        read(p[0],inbuff,msgsize);

        printf("%s \n",inbuff);

        }

        }
```

Output:

```
 hello world
```

b) Aim: To write C programs to create semaphore id

Program :

```
#include<unistd.h>
 #include<sys/ipc.h>
 main()
{
 int semid,key,nsem,flag;
 key=(key_t)0X200f;
flag=IPC_CREAT|0666;
nsem=1;
semid=semget(key,nsem,flag);
printf("Created a semaphore
        with  id: %d \n",semid);
}
```

Output:

Created a semaphore with id: 589832

c) Aim: To write C programs to create shared memory id

Program :

```
#include<sys/types.h>
#include<sys/ipc.h>
#include<sys/shm.h>
main()
{
int shmid,flag;
        key_t key=0X1000;
        shmid=shmget(key,10,IPC_CREAT|0666);
        if(shmid<0)
        {
        perror("shmid failed");
            exit(1);
        }
        printf("Success shmid is %d /n",shmid);
}
```

Output:

Success shmid is: 682340

d) **Aim: To write a C program for simulating File management process(Read,Write)**

Program:

```
#include <unistd.h>
#include <sys/types.h>
#include <fcntl.h>
main()
{
int fd1,fd2,n;
char *ch;
fd1=open("file1", O_CREAT|O_RDWR,0666);
if(fd1==-1)
{
printf("source filw cannot be processed \n");
exit(0);
}
fd2=open("file2",O_CREAT|O_RDWR,0666);
if(fd2==-1)
{
printf("destination file cannot be processed \n");
exit(0);
}
while(1)
{
n=read(fd1,ch,1);
if(n==0)
41
break;
write(fd2,ch,1);
}
close(fd1);
close(fd2);
}
```

Output:

```
vi file1
good morning
cc filerw.c
./a.out
vi file2
good morning
```

3)Input/Output System calls

Write a C program to simulate IO System calls

AIM: To write a C program for simulating IO System calls

Program:

```
#include<stdio.h>
#include<unistd.h>
#include<string.h>
#include<fcntl.h>
main( )
{
int fd[2];
char buf1[25]= "just a test\n";
char buf2[50];
fd[0]=open("file1",O_RDWR);
fd[1]=open("file2",O_RDWR);
write(fd[0], buf1, strlen(buf1));
printf("\n Enter the text now....");
scanf("\n %s",buf1);
printf("\n Cat file1 is \n hai");
write(fd[0], buf1, strlen(buf1));
lseek(fd[0], SEEK_SET, 0);
read(fd[0], buf2, sizeof(buf1));
write(fd[1], buf2, sizeof(buf2));
close(fd[0]);
close(fd[1]);
printf("\n");
return 0;
}
```

Output:

```
Enter the text now....abcdef

Cat file1 is
hai
```

Cycle-2: simulate the following CPU scheduling algorithms

---

a) write a C program for simulating the FCFS (First Come First Serve) CPU scheduling algorithm

Aim: To write a C program for simulating FCFS (first come first serve) CPU Scheduling Algorithm

Program:

```
#include<stdio.h>
#include<conio.h>
void main()
{
int arrival[10],burst[10],start[10],finish[10],wait[10],turn[10];
int i,j,n,sum=0;
float totalwait=0.0,totalturn=0.0;
float avgwait=0.0,avgturn=0.0;
start[0]=0;
printf("Enter number of Process:");
scanf("%d",&n);
for(i=0;i<n;i++)
{
printf("\n Enter process %d Arrival and Burst time \n",(i+1));
scanf("%d %d",&arrival[i],&burst[i]);
}
for(i=0;i<n;i++)
{
sum=0;
for(j=0;j<i;j++)
{
sum=sum+burst[j];
}
start[i]=sum;
}

for(i=0;i<n;i++)
{
finish[i]=burst[i]+start[i];
wait[i]=start[i]-arrival[i];
turn[i]=burst[i]+wait[i];
}
for(i=0;i<n;i++)
{
totalwait=totalwait+wait[i];
totalturn=totalturn+turn[i];
}
avgwait=totalwait/n;
```

```
avgturn=totalturn/n;
printf("\n Arrival Burst Start Finish Wait Turn \n");
for(i=0;i<n;i++)
{
printf("%7d %5d %5d %6d %4d %4d \n",arrival[i],burst[i],start[i],finish[i],wait[i],turn[i]);
}
printf("Average waiting time %f\n",avgwait);
printf("Average turnaround time %f\n",avgturn);
getch();
}
```

Output:

Enter number of Process: 3

Enter process 1 Arrival and Burst time

0 24

Enter process 2 Arrival and Burst time

0 3

Enter process 3 Arrival and Burst time

0 3

Arrival Burst Start Finish Wait Turn

0 24 0 24 0 24

0 3 24 27 24 27

0 3 27 30 27 30

Average waiting time 17.000000

Average turnaround time 27.000000

b) Write a C program for simulating the SFJ (Shortest Job First) CPU scheduling algorithm

Aim: To write a C program for simulating SJF (Shortest Job First) CPU Scheduling Algorithm

Program:

```
#include<stdio.h>
#include<conio.h>
void main()
{
int i,j,burst[10],start[10],finish[10],wait[10];
int n,temp;
float totalwait=0.0,totalturn=0.0;
float avgwait,avgturn;
printf("Enter number of Process:");
scanf("%d",&n);
for(i=1;i<=n;i++)
{
printf("\n Enter process %d Burst time:",i);
scanf("%d",&burst[i]);
}
for(i=1;i<=n;i++)
{
for(j=i+1;j<=n;j++)
{
if(burst[i]>burst[j])
{
temp=burst[i];
burst[i]=burst[j];
burst[j]=temp;
}
}
}
for(i=1;i<=n;i++)
{
if(i==1)
{
start[i]=0;
finish[i]=burst[i];
wait[i]=0;
}
else
{
start[i]=finish[i-1];
finish[i]=start[i]+burst[i];
wait[i]=start[i];
}
}
```

```
printf("\n Burst Start Finish Wait \n");
for(i=1;i<=n;i++)
{
printf("%5d %5d %6d %4d\n",burst[i],start[i],finish[i],wait[i]);
}
for(i=1;i<=n;i++)
{
totalwait=totalwait+wait[i];
totalturn=totalturn+finish[i];
}
avgwait=totalwait/n;
avgturn=totalturn/n;
printf("Average Waiting time %f \n",avgwait);
printf("Average Turn over time %f \n",avgturn);
getch();
}
```

Output:

Enter number of Process:3

Enter process 1 Burst time:27

Enter process 2 Burst time:1

Enter process 3 Burst time:2

Burst Start Finish Wait

1 0 1 0

2 1 3 1

27 3 30 3

Average waiting time 1.333333

Average Turn over time 11.333333

c) Write a C program for simulating the Round robin CPU scheduling algorithm

AIM: To write a C program for simulating the Round Robin CPU Scheduling Algorithm

Program:

```
#include<stdio.h>
#include<conio.h>
void main()
{
        int start[10],burst[10],need[10],execution[10],wait[10],finish[10],turn[10];
        int i,ts,n,totaltime=0,totalburst=0;
        float totalwait=0.0,totalturn=0.0,totalresp=0.0;
        float avgwait=0.0,avgturn=0.0,avgresp=0.0;
        clrscr();
        printf("Enter number of processes");
        scanf("%d",&n);
        for(i=0;i<n;i++)
        {
        printf("Enter process %d burst time",(i+1));
        scanf("%d",&burst[i]);
        }
        printf("Enter time slice");
        scanf("%d",&ts);
        for(i=0;i<n;i++)
        {
        need[i]=burst[i];
        execution[i]=0;
        wait[i]=0;
        finish[i]=0;
        turn[i]=0;
        totalburst=totalburst+burst[i];
        }
        while(totalburst>0)
        {
        for(i=0;i<n;i++)
        {
           if(execution[i]==0)
        {
        start[i]=totaltime;
        }
        if(need[i]>ts)
        {
        execution[i]=execution[i]+ts;
        need[i]=need[i]-ts;
        totaltime=totaltime+ts;
        totalburst=totalburst-ts;
        }
        else
```

```
        {
        if(need[i]>0)
        {
        execution[i]=execution[i]+need[i];
        totaltime=totaltime+need[i];
        wait[i]=totaltime-execution[i];
         finish[i]=wait[i]+burst[i];
        turn[i]=wait[i]+burst[i];
        totalburst=totalburst-need[i];
        need[i]=0;
        }
        }
   }
}
printf("\n process burst start wait finish turnaround ");
for(i=0;i<n;i++)
{
printf("%7d %5d %5d %5d %4d %6d \n",(i+1),burst[i],start[i],wait[i],finish[i],turn[i]);
}
for(i=0;i<n;i++)
{
        totalwait=totalwait+wait[i];
        totalturn=totalturn+turn[i];
        totalresp=totalresp+start[i];
}
avgwait=totalwait/n;
avgturn=totalturn/n;
avgresp=totalresp/n;
printf("\n Average waiting time %f\n",avgwait);
printf("\n Average turnaround time %f\n",avgturn);
printf("\n Average response time %f\n",avgresp);
getch();
}
```

Output:

Enter number of processes 3

Enter process 1 burst time 24

Enter process 2 burst time 3

Enter process 3 burst time 3

Enter time slice 2

Process burst start wait finish turnaround

1 24 0 6 30 30

2 3 2 6 9 9

3 3 4 7 10 10

Average waiting time 6.333333

Average turnaround time 16.333334

Average response time 2.000000

d)Write a C program for simulating the Priority CPU scheduling algorithm

Aim: To write a C program for simulating Priority CPU Scheduling Algorithm

PROGRAM:

```
#include<stdio.h>
#include<conio.h>
void main()
{
int burst[10],pri[10],wait[10],start[10],finish[10];
int i,j,temp1,temp2,n,totalwait=0,totalavg=0,totalturn=0;
float avgwait=0.0,avgturn=0.0;
printf("Enter n value");
scanf("%d",&n);
for(i=1;i<=n;i++)
{
printf("\n Enter Burst time and priority of process %d",i);
scanf("%d %d",&burst[i],&pri[i]);
}
for(i=1;i<=n;i++)
{
for(j=1;j<=n;j++)
{
if(pri[i]>pri[j])
{
temp1=pri[i];
pri[i]=pri[j];
pri[j]=temp1;
temp2=burst[i];
burst[i]=burst[j];
burst[j]=temp2;
}
}
}
for(i=1;i<=n;i++)
{
if(i==1)
{
start[i]=0;
finish[i]=burst[i];
wait[i]=start[i];}
else
{
start[i]=finish[i-1];
finish[i]=start[i]+burst[i];
wait[i]=start[i];
}
}
printf("\n Burst Priority Start Wait Finsih \n");
```

```
for(i=1;i<=n;i++)
{
printf("%5d %8d %5d %4d  %6d ",burst[i],pri[i],start[i],wait[i],finish[i]);
}
for(i=1;i<=n;i++)
{
totalwait=totalwait+wait[i];
totalturn=totalturn+finish[i];
}
avgwait=totalwait/n;
avgturn=totalturn/n;
printf("\n Average waiting time=%f \n",avgwait;
printf("\n Average turnaround time=%f \n",avgturn);
getch();
}
```

Output:

Enter n value 3

Enter Burst time and priority of process 1

24 3

Enter Burst time and priority of process 2

3 2

Enter Burst time and priority of process 3

3 1

Burst Priority Start Wait Finnish

24 3 0 0 24

3 2 24 24 27

3 1 27 27 30

Average waiting time=17.000000

Average turnaround time=27.000000

Cycle-3: Simulate the file allocation strategies

---

a)Write a c program for simulating the Sequential File Allocation algorithm

Aim: To write a c program to simulate Sequential File Allocation Strategy

Program:

```
#include<stdio.h>
#include<conio.h>
void main()
{
  int memory[25];
  int i,len,startaddr,flag,endaddr,name;
  for(i=0;i<25;i++)
  {
     memory[i]=0;
     printf("%d",memory[i]);
  }
  printf("\n Enter file name(0 to quit):");
  scanf("%d",&name);
  while(name!=0)
  {
     printf("\n Enter length of file:");
     scanf("%d",&len);
     printf("\n enter starting location of the file :");
     scanf("%d",&startaddr);
     endaddr=startaddr+len;
     flag=0;
     for(i=startaddr;(i<endaddr && endaddr<25);i++)
     {
        if(memory[i]!=0)
        {
          flag=1;
          printf("\n No sufficient memory to fill ....");
          break;
        }
     }
     if(flag==0)
     {
       for(i=startaddr;i<endaddr;i++)
       {
          memory[i]=name;
       }
     }
     printf("\n enter file name(0 to quit):");
     scanf("%d",&name);
  }
  for(i=0;i<25;i++)
  {
    printf("%d",memory[i]);
  }
```

```
  getch()
}
```

Output:

```
00000000000000000000000000
 Enter file name(0 to quit):1

 Enter length of file:3

 enter starting location of the file :1

 enter file name(0 to quit):2

 Enter length of file:4

 enter starting location of the file :3

 No sufficient memory to fill ....
 enter file name(0 to quit):3

 Enter length of file:5

 enter starting location of the file :4

 enter file name(0 to quit):0
01113333300000000000000000
```

b) Write a C program for simulating the Indexed File Allocation algorithm

Aim: To write a C program for simulating the Indexed File Allocation algorithm

Program:

```
#include<stdio.h>
//#include<conio.h>
#include<stdlib.h>
struct block
{
  int bno,flag;
};
struct block b[100];
int rnum();
void main()
{
  int p[10],r[10][10],ab[10],i,j,n,s;
  //clrscr();
  printf("\nInput");
  printf("\nentyer no.of files:");
  scanf("%d",&n);
  for(i=1;i<=n;i++)
  {
     printf("\nenter size of block %d:",i);
     scanf("%d",&p[i]);
  }
  for(i=1;i<=n;i++)
  {
    s=rnum();
    ab[i]=s;
    for(j=0;j<p[i];j++)
    {
       s=rnum();
       r[i][j]=s;
    }
  }
  printf("\n output");
  for(i=1;i<=n;i++)
  {
    printf("\nfile %d \n block %d contains:",i,ab[i]);
    for(j=0;j<p[i];j++)
    {
      printf("%6d",r[i][j]);
    }
  }
 }
 int rnum()
 {
   int k=0,i;
   for(i=1;i<=100;i++)
   {
      k=rand()%100;
      if(b[k].flag!=-1)
```

```
      break;
    }
    return k;
}
```

Output:

```
Input
entyer no.of files:3

enter size of block 1:5

enter size of block 2:6

enter size of block 3:9

 output
file 1
 block 83 contains:    86    77    15    93    35
file 2
 block 86 contains:    92    49    21    62    27    90
file 3
 block 59 contains:    63    26    40    26    72    36    11    68    67
```

c)Write a C program for simulating the Linked File Allocation algorithm

Aim: To write a C program for simulating the Linked File Allocation algorithm

Program:

```
#include<stdio.h>
#include<stdlib.h>
#include<string.h>
typedef struct
{
int bno,flag,bn[20];
}
block;
block b[100],b1;
void main()
{
  int rnum();
  int p[30],kk[20],i,n,t,s1,s,r,j,c=1;
  //clrscr();
  printf("\n enter no of inputs files:");
  scanf("%d",&n);
  printf("\n input the requirements:");
  for(i=1;i<=n;i++)
  {
  printf("\n enter no of blocks needed for file%d:",i);
  scanf("%d",&p[i]);
  }
  t=1;
  for(i=1;i<=n;i++)
  {
  for(j=1;j<=p[i];j++)
  {
  s=rnum();
  b[s].flag=1;
  b[c].bno=s;
  r=p[i]-1;
  kk[i]=s;
  t=1;
  c++;
  }
  }
  while(r!=0)
  {
  s1=rnum();
  b[s].bn[t]=s1;
  b[s].flag=1;
  b[i].bno=s1;
  r=r-1;
  t=t+1;
  }
  c++;
```

```
  printf("\n allocation\n");
  c=1;
  for(i=1;i<=n;i++)
  {
            printf("\nallocated for file %d:",i);
            for(j=1;j<=p[i];j++)
            {
            if(j==1)
            {
            printf("%3d",b[c].bno);
            c++;
            }
            else
            {
               printf("--->%3d",b[c].bno);
               c++;
            }
  }
  printf("\n");
}
}
int rnum()
{
int k=0,i;
for(i=1;i<=100;i++)
{
k=rand()%100;
k+=10;
if(b[k].flag!=1)
break;
}
return k;
}
```

Output:

```
enter no of inputs files:3

 input the requirements:
 enter no of blocks needed for file1:5

 enter no of blocks needed for file2:4

 enter no of blocks needed for file3:2

 allocation

allocated for file 1: 93---> 96---> 87--->100--->103

allocated for file 2: 45--->102---> 59---> 31

allocated for file 3: 72---> 37
```

Cycle-4:

---

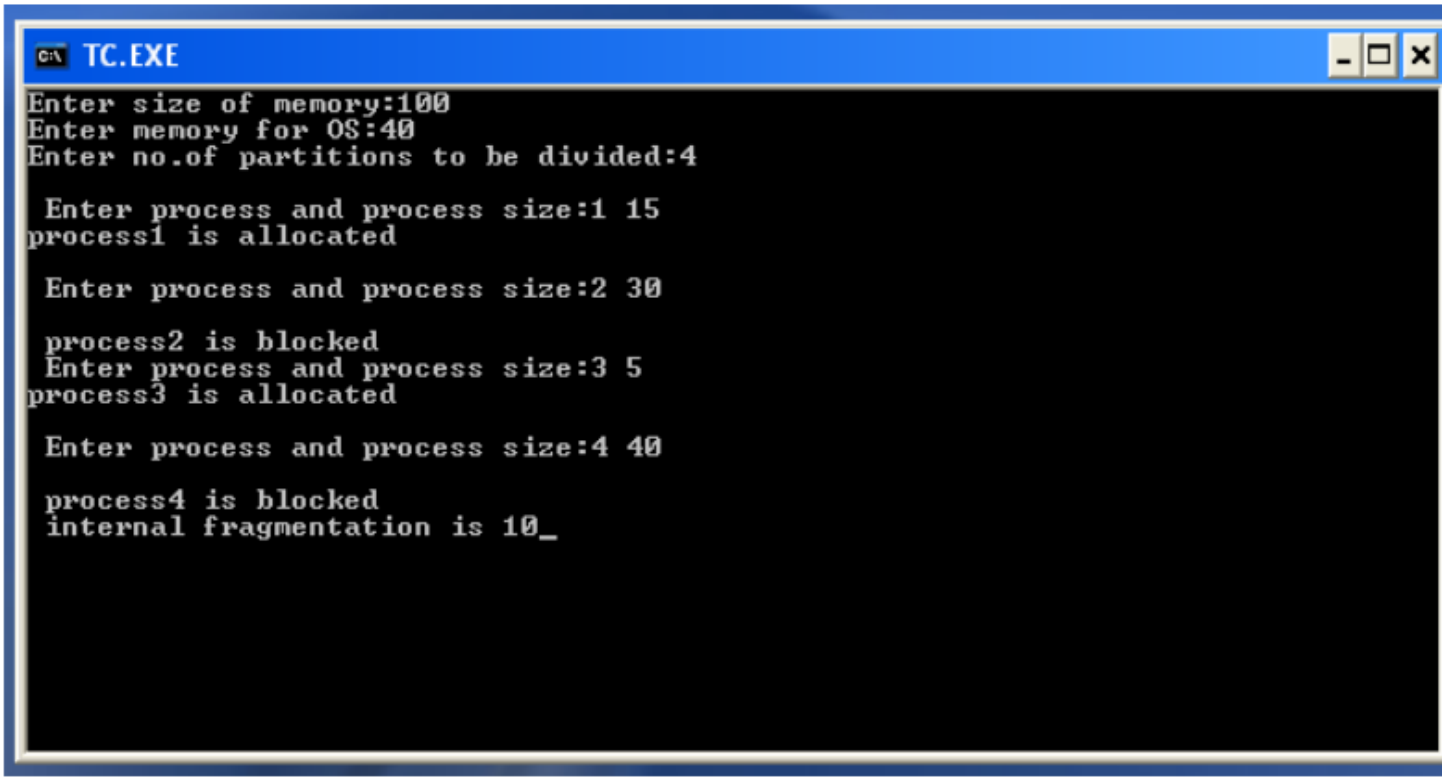
a) Write a C program to simulate MFT(Multiprogramming with Fixed number of Tasks)

Aim: To write a C program to simulate MFT(Multiprogramming with Fixed number of Tasks)

Program:

```
#include<stdio.h>
#include<conio.h>
main()
{
    int ms,i,ps[20],n,size,p[20],s,intr=0;
    clrscr();
    printf("Enter size of memory:");
    scanf("%d",&ms);
    printf("Enter memory for OS:");
    scanf("%d",&s);
    ms-=s;
    printf("Enter no.of partitions to be divided:");
    scanf("%d",&n);
    size=ms/n;
    for(i=0;i<n;i++)
    {
            printf("\n Enter process and process size:");
            scanf("%d%d",&p[i],&ps[i]);
            if(ps[i]<=size)
            {
                    intr=intr+size-ps[i];
                    printf("process%d is allocated\n",p[i]);
            }
            else
                    printf("\n process%d is blocked",p[i]);
    }
    printf("\n internal fragmentation is %d",intr);
    getch();
}
```

Output:


TC.EXE
Enter size of memory:100
Enter memory for OS:40
Enter no.of partitions to be divided:4
Enter process and process size:1 15
process1 is allocated
Enter process and process size:2 30
process2 is blocked
Enter process and process size:3 5
process3 is allocated
Enter process and process size:4 40
process4 is blocked
internal fragmentation is 10_

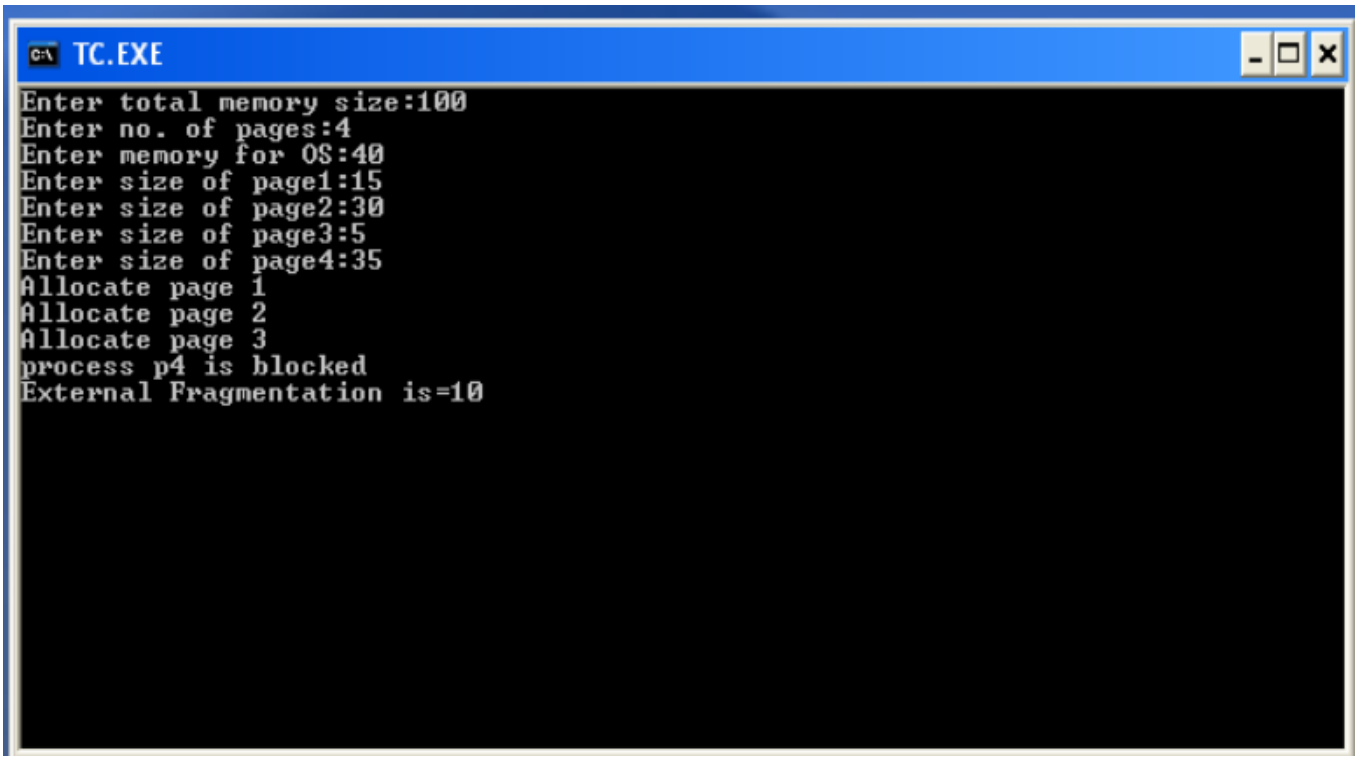
b) Write a C programming to simulate MFT(Multiprogramming with Variable number of Tasks)

Aim: To write a C program to simulate MVT (Multiprogramming with Variable number of Tasks)

Program:

```
#include<stdio.h>
#include<conio.h>
main()
{
    int i,m,n,tot,s[20];
    clrscr();
    printf("Enter total memory size:");
    scanf("%d",&tot);
    printf("Enter no. of pages:");
    scanf("%d",&n);
    printf("Enter memory for OS:");
    scanf("%d",&m);
    for(i=0;i<n;i++)
    {
            printf("Enter size of page%d:",i+1);
            scanf("%d",&s[i]);
    }
    tot=tot-m;
    for(i=0;i<n;i++)
    {
            if(tot>=s[i])
            {
                    printf("Allocate page %d\n",i+1);
                    tot=tot-s[i];
            }
            else
                    printf("process p%d is blocked\n",i+1);
    }
    printf("External Fragmentation is=%d",tot);
    getch();
}
```

Output:


TC.EXE
Enter total memory size:100
Enter no. of pages:4
Enter memory for OS:40
Enter size of page1:15
Enter size of page2:30
Enter size of page3:5
Enter size of page4:35
Allocate page 1
Allocate page 2
Allocate page 3
process p4 is blocked
External Fragmentation is=10

Simulate contiguous memory allocation techniques
a) Worst-fit b) Best-fit c) First-fit

a)Write a C program to simulate Worst-Fit memory allocation technique

Aim: To Write a C program for simulating Worst-Fit memory allocation technique

Program:

```
#include<stdio.h>

#include<conio.h>

#define max 25

void main()

{

int frag[max],b[max],f[max],i,j,nb,nf,temp,highest=0;

static int bf[max],ff[max];

clrscr();

printf("\nEnter the number of blocks:");

scanf("%d",&nb);

printf("Enter the number of files:");

scanf("%d",&nf);

printf("\nEnter the size of the blocks:-\n");

for(i=1;i<=nb;i++)

{

printf("Block %d:",i);

scanf("%d",&b[i]);

}

printf("Enter the size of the files:-\n");

for(i=1;i<=nf;i++)

{

printf("File %d:",i);

scanf("%d",&f[i]);

}
```

```
for(i=1;i<=nf;i++)
{
for(j=1;j<=nb;j++)
{
if(bf[j]!=1) //if bf[j] is not allocated
{
temp=b[j]-f[i];
if(temp>=0)
if(highest<temp)
{
ff[i]=j;
highest=temp;
}
}
}
frag[i]=highest;
bf[ff[i]]=1;
highest=0;
}
printf("\nFile_no \tFile_size \tBlock_no \tBlock_size \tFragment");
for(i=1;i<=nf;i++)
printf("\n%d\t\t%d\t\t%d\t\t%d\t\t%d",i,f[i],ff[i],b[ff[i]],frag[i]);
getch();
}
```

Output:

```
Enter the number of blocks:4
Enter the number of files:3

Enter the size of the blocks:-
Block 1:5
Block 2:8
Block 3:4
Block 4:10
Enter the size of the files:-
File 1:1
File 2:4
File 3:7

File_no         File_size       Block_no        Block_size      Fragment
1               1               4               10              9
2               4               2               8               4
3               7               0               0               0
```

b)Write a C program to simulate Best-Fit memory allocation technique

Aim: To Write a C program for simulating Best-Fit memory allocation technique

Program:

```
#include<stdio.h>

#include<conio.h>

#define max 25

void main()

{

int frag[max],b[max],f[max],i,j,nb,nf,temp,lowest=10000;

static int bf[max],ff[max];

clrscr();

printf("\nEnter the number of blocks:");

scanf("%d",&nb);

printf("Enter the number of files:");

scanf("%d",&nf);

printf("\nEnter the size of the blocks:-\n");

for(i=1;i<=nb;i++)

{

printf("Block %d:",i);

scanf("%d",&b[i]);

}

printf("Enter the size of the files:-\n");

for(i=1;i<=nf;i++)

{

printf("File %d:",i);

scanf("%d",&f[i]);

}

for(i=1;i<=nf;i++)
```

```
{
for(j=1;j<=nb;j++)
{
if(bf[j]!=1)
{
temp=b[j]-f[i];
if(temp>=0)
if(lowest>temp)
{
ff[i]=j;
lowest=temp;
}
}
}
frag[i]=lowest;
bf[ff[i]]=1;
lowest=10000;
}
printf("\nFile_no \tFile_size \tBlock_no \tBlock_size \tFragment");
for(i=1;i<=nf && ff[i]!=0;i++)
printf("\n%d\t\t%d\t\t%d\t\t%d\t\t%d",i,f[i],ff[i],b[ff[i]],frag[i]);
getch();
}
```

Output:

```
Enter the number of blocks:4
Enter the number of files:3

Enter the size of the blocks:-
Block 1:5
Block 2:8
Block 3:4
Block 4:10
Enter the size of the files:-
File 1:1
File 2:4
File 3:7

File_no         File_size       Block_no        Block_size      Fragment
1               1               3               4               3
2               4               1               5               1
3               7               2               8               1
```

c)Write a C program to simulate First-Fit memory allocation technique

Aim: To Write a C program for simulating First-Fit memory allocation technique

Program:

```
#include<stdio.h>

#include<conio.h>

#define max 25

void main()

{

int frag[max],b[max],f[max],i,j,nb,nf,temp;

static int bf[max],ff[max];

clrscr();

printf("\nEnter the number of blocks:");

scanf("%d",&nb);

printf("Enter the number of files:");

scanf("%d",&nf);

printf("\nEnter the size of the blocks:-\n");

for(i=1;i<=nb;i++)

{

printf("Block %d:",i);

scanf("%d",&b[i]);

}

printf("Enter the size of the files:-\n");

for(i=1;i<=nf;i++)

{

printf("File %d:",i);

scanf("%d",&f[i]);

}

for(i=1;i<=nf;i++)
```

```
{
for(j=1;j<=nb;j++)
{
if(bf[j]!=1)
{
temp=b[j]-f[i];
if(temp>=0)
{
ff[i]=j;
break;
}
}
}
frag[i]=temp;
bf[ff[i]]=1;
}
printf("\nFile_no:\tFile_size :\tBlock_no:\tBlock_size:\tFragment");
for(i=1;i<=nf;i++)
printf("\n%d\t\t%d\t\t%d\t\t%d\t\t%d",i,f[i],ff[i],b[ff[i]],frag[i]);
getch();
}
```

Output:

```
Enter the number of blocks:4
Enter the number of files:3

Enter the size of the blocks:-
Block 1:5
Block 2:8
Block 3:4
Block 4:10
Enter the size of the files:-
File 1:1
File 2:4
File 3:7

File_no:        File_size :     Block_no:       Block_size:     Fragment
1               1               1               5               4
2               4               2               8               4
3               7               4               10              3_
```

Cycle-5: Simulate all File Organization techniques

---

a) Write a C program to simulate Single Level Directory file Organization technique

Aim: To write a C program for simulating Single level Directory file Organization technique

Program:

```
#include<stdio.h>
//#include<conio.h>
#include<string.h>
void main()
{
int nf=0,i=0,j=0,ch;
char mdname[10],fname[10][10],name[10];
//clrscr();
printf("Enter the directory name:");
scanf("%s",mdname);
printf("Enter the number of files:");
scanf("%d",&nf);
do
{
printf("Enter file name to be created:");
scanf("%s",name);
for(i=0;i<nf;i++)
{
if(!strcmp(name,fname[i]))
break;
}
if(i==nf)
{
strcpy(fname[j++],name);
nf++;
}
else
printf("There is already %s\n",name);
printf("Do you want to enter another file(yes - 1 or no - 0):");
scanf("%d",&ch);
}
while(ch==1);
printf("Directory name is:%s\n",mdname);
printf("Files names are:");
for(i=0;i<j;i++)
printf("\n%s",fname[i]);
//getch();
}
```

Output:

```
Enter the directory name:abc
Enter the number of files:2
```

```
Enter file name to be created:aaa
Do you want to enter another file(yes - 1 or no - 0):1
Enter file name to be created:bbb
Do you want to enter another file(yes - 1 or no - 0):0
Directory name is:abc
Files names are:
aaa
bbb
```

b) Write a C program to simulate Two Level Directory file Organization technique

Aim: To write a C program for simulating Two level Directory file Organization technique

Pogram:

```
#include<stdio.h>
//#include<conio.h>
#include<string.h>
struct st
{
char dname[10];
char sdname[10][10];
char fname[10][10][10];
int ds,sds[10];
}dir[10];
void main()
{
int i,j,k,n;
//clrscr();
printf("enter number of directories:");
scanf("%d",&n);
for(i=0;i<n;i++)
{
printf("enter directory %d names:",i+1);
scanf("%s",dir[i].dname);
printf("enter size of directories:");
scanf("%d",&dir[i].ds);
for(j=0;j<dir[i].ds;j++)
{
printf("enter subdirectory name and size:");
scanf("%s",dir[i].sdname[j]);
scanf("%d",&dir[i].sds[j]);
for(k=0;k<dir[i].sds[j];k++)
{
printf("enter file name:");
scanf("%s",dir[i].fname[j][k]);
}
}
}
printf("\ndirname\t\tsize\tsubdirname\tsize\tfiles");
printf("\n*************************************************\n");
for(i=0;i<n;i++)
{
printf("%s\t\t%d",dir[i].dname,dir[i].ds);
for(j=0;j<dir[i].ds;j++)
{
printf("\t%s\t\t%d\t",dir[i].sdname[j],dir[i].sds[j]);
for(k=0;k<dir[i].sds[j];k++)
printf("%s\t",dir[i].fname[j][k]);
printf("\n\t\t");
}
printf("\n");
```

```
}
//getch();
}
```

OUTPUT:

```
enter number of directories:1
enter directory 1 names:aaa
enter size of directories:2
enter subdirectory name and size:abc 2
enter file name:bb
enter file name:cc
enter subdirectory name and size:def 2
enter file name:dd
enter file name:ee

dirname        size    subdirname      size    files
*****************************************************
aaa              2          abc          2      bb      cc
                            def          2      dd      ee
```

c)Write a C program to simulate Hierarchical Level Directory file Organization technique

Aim: To write a C program for simulating Single level Directory file Organization technique

Program:

```
#include<stdio.h>
#include<stdlib.h>
struct node{
char N[25];
int df;
struct node *pc;
struct node *ps;
};
struct node *A[20];
int in = 0,c = 0;
void create(struct node *P,int N)
{
int i;
struct node *Tmp,*T;
Tmp = P;
for(i = 0 ;i<N;i++)
{
T = malloc(sizeof(struct node));
printf("Enter name:");
scanf("%s",T->N);
printf("Enter dir(1) or file(0): ");
scanf("%d",&T->df);
if(T-> df == 1)
{
A[c] = T;
c++;
}
T->pc = NULL;
T->ps = NULL;
if(i == 0)
{
Tmp -> pc = T;
Tmp = T;
}
else{
Tmp -> ps = T;
Tmp = T;
}
}
}
void display(struct node *P)
{
int i;
P = P->pc;
do{
```

```
printf("\n%s(%d)",P->N,P->df);
if(P->df == 1 && P->pc != NULL)
display(P);
P = P->ps;
}while(P!=NULL);
}
void main()
{
int nu,nc,i,j,k;
struct node *Hdr;
Hdr = malloc(sizeof(struct node));
Hdr->df = 1;
Hdr->pc = NULL;
Hdr->ps = NULL;
printf("Enter number of users: ");
scanf("%d",&nu);
create(Hdr,nu);
for(in = 0;in<c;in++)
{
printf("\nEnter number of child nodes for %s: ",A[in]->N);
scanf("%d",&nc);
create(A[in],nc);
}
printf("\nHierarchical\n");
display(Hdr);
}
```

Output:

```
Enter number of users: 1
Enter name:aaa
Enter dir(1) or file(0): 1

Enter number of child nodes for aaa: 2
Enter name:file1
Enter dir(1) or file(0): 0
Enter name:file2
Enter dir(1) or file(0): 1

Enter number of child nodes for file2: 0

Hierarchical

aaa(1)
file1(0)
```

file2(1)

d)Write a C program to simulate DAG file Organization technique

Aim: To write a C program for simulating DAG file Organization technique

Program:

```
#include<stdio.h>
//#include<conio.h>
#include<string.h>
struct node
{
char N[25];
int df;
struct node *ptr;
};
struct node *A[20];
int in=0;c=0;
 void display()
 {
  int i;
  struct node *P;
  for(i=0;i<c;i++)
  {
   P = A[i];
   printf("\n%s(%d)",P->N,P->df);
   P = P->ptr;

   while(P!= NULL)
   {
    printf("->%s(%d)",P->N,P->df);
    P = P->ptr;
   }
  }
 }
  void DAG()
  {
  struct node *T,*P,*Tmp;
  int i,j,Flag,nv;
  for(in=0;in<c;in++)
  {
   P = A[in];
   printf("\n enter no.of adjacent vertices for %s:",A[in]->N);
   scanf("%d",&nv);
   for(i=0;i<nv;i++)
   {
    T = malloc(sizeof(struct node));
    printf("enter name");
    scanf("%s",T->N);
    printf("enter dir(1) or file(0):");
    scanf("%d",&T->df);
    T->ptr = T;
    P=T;
    if(T->df==1)
```

```
{
 Flag = 1;
 for(j=0;j<c;j++)
 {
  if(strcmp(A[j]->N,T->N)==0)
  {
  Flag = 0;
  break;
  }
 }
if(Flag==1)
{
 Tmp = malloc(sizeof(struct node));
 strcpy(Tmp->N,T->N);
 Tmp->df = T->df;
 Tmp->ptr = NULL;
 A[c] = Tmp;
 c++;
}
}
}
}
}
void create(int N)
{
 int i;
 struct node *T;
 for(i=0;i<N;i++)
 {
  T = malloc(sizeof(struct node));
  printf("enter name:");
  scanf("%s",T->N);
  printf("enter dir(1) or file(0):");
  scanf("%d",&T->df);
  T->ptr=NULL;
  A[c]=T;
  c++;
 }
 }
 void main()
 {
 int nu;
 //clrscr();
 printf("enter no.of users:");
 scanf("%d",&nu);
 create(nu);
 DAG();
 printf("\n DAG - adjancey list representation\n");
 display();
 //getch();
}
```

Output:

```
enter no.of users:2
enter name:abc
enter dir(1) or file(0):1
enter name:def
enter dir(1) or file(0):0

enter no.of adjacent vertices for abc:2
enter name:aaa
enter dir(1) or file(0):0
enter name:bbb
enter dir(1) or file(0):0

enter no.of adjacent vertices for def:1
enter name: hhh
enter dir(1) or file(0):0

 DAG - adjancey list representation

abc(1)
def(0)
```

Cycle-6: simulate bankers algorithm for Deadlock Avoidance and Deadlock Prevention

---

a)Write a C program to simulate Bankers Algorithm for Deadlock Avoidance

Aim: To write a C program for simulating Bankers Algorithm for Deadlock Avoidance

Program:

```
#include<stdio.h>
//#include<conio.h>
void main()
{
int available[3],work[5],max[5][3],allocation[5][3],need[5][3],safe[5],totalres[5];
char finish[5];
int i,j,k,totalloc=0,state,value=0;
//clrscr();
printf("Enter Instances of each Resource");
for(i=0;i<3;i++)
{
scanf("%d",&totalres[i]);
}
printf("Enter Maximum resources for each processes");
for(i=0;i<5;i++)
{
for(j=0;j<3;j++)
{
printf("\n Enter process %d Resource %d",i,(j+1));
scanf("%d",&max[i][j]);
}
}
//clrscr();
printf("Enter number of resources allocated to each Process");
for(i=0;i<5;i++)
{
for(j=0;j<3;j++)
{
printf("\n Enter the resource of R%d allocated to process %d",(j+1),i);
scanf("%d",&allocation[i][j]);
}
}
for(i=0;i<5;i++)
{
for(j=0;j<3;j++)
{
need[i][j]=max[i][j]-allocation[i][j];
}
}
for(i=0;i<5;i++)
{
finish[i]='f';
}
```

```
for(i=0;i<3;i++)
{
totalloc=0;
for(j=0;j<5;j++)
{
totalloc=totalloc+allocation[j][i];
}
available[i]=totalres[i]-totalloc;
work[i]=available[i];
}
//clrscr();
printf("\n Allocated Resources \n");
for(i=0;i<5;i++)
{
for(j=0;j<3;j++)
{
printf("%d",allocation[i][j]);
}
printf("\n");
}
printf("\n Maximum Resources \n");
for(i=0;i<5;i++)
{
for(j=0;j<3;j++)
{
printf("%d",max[i][j]);
}
printf("\n");
}
printf("\n Needed Reources \n");
for(i=0;i<5;i++)
{
for(j=0;j<3;j++)
{
printf("%d",need[i][j]);
}
printf("\n");
}
printf("\n Available Reources");
for(i=0;i<3;i++)
{
printf("%d",available[i]);
}
printf("\n");
for(i=0;i<5;i++)
{
for(j=0;j<3;j++)
{
if((finish[i]=='f')&&(need[i][j]<=work[j]))
{
state=1;
```

```
continue;
}
else
{
state=0;
break;
}
}
if(state==1)
{
for(j=0;j<3;j++)
{
work[j]=work[j]+allocation[i][j];
}
finish[i]='t';
safe[value]=i;
++value;
}
if(i==4)
{
if(value==5)
{
break;
}
else
{
i=-1;
}
}
}
printf("\n Safe States are");
for(i=0;i<5;i++)
{
printf("P%d",safe[i]);
}
}
```

Output:

```
Enter Instances of each Resource 10
5
7
Enter Maximum resources for each processes
 Enter process 0 Resource 1: 7
 Enter process 0 Resource 2: 5
 Enter process 0 Resource 3: 3
 Enter process 1 Resource 1: 3
 Enter process 1 Resource 2: 2
 Enter process 1 Resource 3: 2
 Enter process 2 Resource 1: 9
 Enter process 2 Resource 2: 0
 Enter process 2 Resource 3: 2
```

Enter process 3 Resource 1: 2
Enter process 3 Resource 2: 2
Enter process 3 Resource 3: 2
Enter process 4 Resource 1: 4
Enter process 4 Resource 2: 3
Enter process 4 Resource 3: 3
Enter number of resources allocated to each Process
Enter the resource of R1 allocated to process 0:0
Enter the resource of R2 allocated to process 0:1
Enter the resource of R3 allocated to process 0:0
Enter the resource of R1 allocated to process 1:2
Enter the resource of R2 allocated to process 1:0
Enter the resource of R3 allocated to process 1:0
Enter the resource of R1 allocated to process 2:3
Enter the resource of R2 allocated to process 2:0
Enter the resource of R3 allocated to process 2:2
Enter the resource of R1 allocated to process 3:2
Enter the resource of R2 allocated to process 3:1
Enter the resource of R3 allocated to process 3:1
Enter the resource of R1 allocated to process 4:0
Enter the resource of R2 allocated to process 40
Enter the resource of R3 allocated to process 4:2

Allocated Resources
010
200
302
211
002

Maximum Resources
753
322
902
222
433

Needed Resources
743
122
600
011
431
Available Reources332
Safe States areP1P3P4P0P2

b)Write a C program to simulate Bankers Algorithm for Deadlock Prevention

Aim: To write a C program for simulating Bankers Algorithm for Deadlock Prevention

Program:

```
#include<stdio.h>
#include<conio.h>
 void main()
{
 int nort,nopro,avail[20],req[20][20],i,j,k,flag=0;
 clrscr();
 printf("\n enter the no of resource types:");
 scanf("%d",&nort);

 printf("\n enter the no of instances of each resource type:");
 for(i=0;i<nort;i++)
 scanf("%d",&avail[i]);

 printf("\n enter the no of processes:");
 scanf("%d",&nopro);

 printf("\n enter the requests of each process:");
 for(i=0;i<nopro;i++)
 for(j=0;j<nort;j++)
 scanf("%d",&req[i][j]);

 for(i=0;i<nopro;i++)
 {
  flag=0;
  for(j=0;j<nort;j++)
  {
   if(req[i][j]>avail[j])
   {
     flag=1;
   }
  }
  if(flag==1)
  {
   printf("\n resources for process p%d cannot be allocated to prevent deadlock",i);
  }
  else
  {
   for(k=0;k<nort;k++)
   {
    avail[k]=avail[k]-req[i][k];
    printf("\n%d instances of resource type R%d are allocated to process
P%d",req[i][k],k,i);
   }
  }
 }
 printf("\n remaining resources after allocation are");
 for(i=0;i<nort;i++)
```

```
 printf("\n  %d",avail[i]);
 getch();
 }
```

Output:

```
enter the no of resource types:2

 enter the no of instances of each resource type:3 4

 enter the no of processes:2

 enter the requests of each process:5 6 2 1

 resources for process p0 cannot be allocated to prevent deadlock
2 instances of resource type R0 are allocated to process P1
1 instances of resource type R1 are allocated to process P1
 remaining resources after allocation are
  1
  3
```

Cycle-7: Simulate disk scheduling algorithms

---

a)Write a C program to simulate FCFS (First Come First Serve) Disk scheduling algorithm

Aim: To write a C program for simulating FCFS (First come First Serve) Disk Scheduling Algorithm

Program:

```
#include<stdio.h>
#include<stdlib.h>
int main()
{
   int RQ[100],i,n,TotalHeadMoment=0,initial;
   printf("Enter the number of Requests\n");
   scanf("%d",&n);
   printf("Enter the Requests sequence\n");
   for(i=0;i<n;i++)
    scanf("%d",&RQ[i]);
   printf("Enter initial head position\n");
   scanf("%d",&initial);

   // logic for FCFS disk scheduling

   for(i=0;i<n;i++)
   {
      TotalHeadMoment=TotalHeadMoment+abs(RQ[i]-initial);
      initial=RQ[i];
   }

   printf("Total head moment is %d",TotalHeadMoment);
   return 0;

}
```

Output:

```
Enter the number of Requests
8
Enter the Requests sequence
95  180 34 119 11 123 62 64
Enter initial head position
50
Total head moment is 644
```

b)Write a C program to simulate SCAN disk scheduling algorithm

Aim: To write a C program for simulating SCAN disk Scheduling Algorithm

Program:

```
#include<stdio.h>
#include<stdlib.h>
int main()
{
   int RQ[100],i,j,n,TotalHeadMoment=0,initial,size,move;
   printf("Enter the number of Requests\n");
   scanf("%d",&n);
   printf("Enter the Requests sequence\n");
   for(i=0;i<n;i++)
    scanf("%d",&RQ[i]);
   printf("Enter initial head position\n");
   scanf("%d",&initial);
   printf("Enter total disk size\n");
   scanf("%d",&size);
   printf("Enter the head movement direction for high 1 and for low 0\n");
   scanf("%d",&move);

   // logic for Scan disk scheduling

      /*logic for sort the request array */
   for(i=0;i<n;i++)
   {
      for(j=0;j<n-i-1;j++)
      {
         if(RQ[j]>RQ[j+1])
         {
            int temp;
            temp=RQ[j];
            RQ[j]=RQ[j+1];
            RQ[j+1]=temp;
         }

      }
   }

   int index;
   for(i=0;i<n;i++)
   {
      if(initial<RQ[i])
      {
         index=i;
         break;
      }
   }

   // if movement is towards high value
   if(move==1)
   {
```

```
        for(i=index;i<n;i++)
        {
            TotalHeadMoment=TotalHeadMoment+abs(RQ[i]-initial);
            initial=RQ[i];
        }
        //  last movement for max size
        TotalHeadMoment=TotalHeadMoment+abs(size-RQ[i-1]-1);
        initial = size-1;
        for(i=index-1;i>=0;i--)
        {
             TotalHeadMoment=TotalHeadMoment+abs(RQ[i]-initial);
             initial=RQ[i];

        }
    }
    // if movement is towards low value
    else
    {
        for(i=index-1;i>=0;i--)
        {
            TotalHeadMoment=TotalHeadMoment+abs(RQ[i]-initial);
            initial=RQ[i];
        }
        //  last movement for min size
        TotalHeadMoment=TotalHeadMoment+abs(RQ[i+1]-0);
        initial =0;
        for(i=index;i<n;i++)
        {
             TotalHeadMoment=TotalHeadMoment+abs(RQ[i]-initial);
             initial=RQ[i];

        }
    }

    printf("Total head movement is %d",TotalHeadMoment);
    return 0;
}
```

Output:

```
Enter the number of Requests
8
Enter the Requests sequence
95 180 34 119 11 123 62 64
Enter initial head position
50
Enter total disk size
200
Enter the head movement direction for high 1 and for low 0
1
Total head movement is 337
```

c)Write a C program to simulate CSCAN disk scheduling algorithm

Aim: To write a C program for simulating CSCAN disk Scheduling Algorithm

Program:

```
#include<stdio.h>
#include<stdlib.h>
int main()
{
   int RQ[100],i,j,n,TotalHeadMoment=0,initial,size,move;
   printf("Enter the number of Requests\n");
   scanf("%d",&n);
   printf("Enter the Requests sequence\n");
   for(i=0;i<n;i++)
    scanf("%d",&RQ[i]);
   printf("Enter initial head position\n");
   scanf("%d",&initial);
   printf("Enter total disk size\n");
   scanf("%d",&size);
   printf("Enter the head movement direction for high 1 and for low 0\n");
   scanf("%d",&move);

   // logic for C-Scan disk scheduling

      /*logic for sort the request array */
   for(i=0;i<n;i++)
   {
      for( j=0;j<n-i-1;j++)
      {
         if(RQ[j]>RQ[j+1])
         {
            int temp;
            temp=RQ[j];
            RQ[j]=RQ[j+1];
            RQ[j+1]=temp;
         }

      }
   }

   int index;
   for(i=0;i<n;i++)
   {
      if(initial<RQ[i])
      {
         index=i;
         break;
      }
   }

   // if movement is towards high value
   if(move==1)
   {
```

```
        for(i=index;i<n;i++)
        {
            TotalHeadMoment=TotalHeadMoment+abs(RQ[i]-initial);
            initial=RQ[i];
        }
        //  last movement for max size
        TotalHeadMoment=TotalHeadMoment+abs(size-RQ[i-1]-1);
        /*movement max to min disk */
        TotalHeadMoment=TotalHeadMoment+abs(size-1-0);
        initial=0;
        for( i=0;i<index;i++)
        {
             TotalHeadMoment=TotalHeadMoment+abs(RQ[i]-initial);
             initial=RQ[i];

        }
    }
    // if movement is towards low value
    else
    {
        for(i=index-1;i>=0;i--)
        {
            TotalHeadMoment=TotalHeadMoment+abs(RQ[i]-initial);
            initial=RQ[i];
        }
        //  last movement for min size
        TotalHeadMoment=TotalHeadMoment+abs(RQ[i+1]-0);
        /*movement min to max disk */
        TotalHeadMoment=TotalHeadMoment+abs(size-1-0);
        initial =size-1;
        for(i=n-1;i>=index;i--)
        {
             TotalHeadMoment=TotalHeadMoment+abs(RQ[i]-initial);
             initial=RQ[i];

        }
    }

    printf("Total head movement is %d",TotalHeadMoment);
    return 0;
}
```

Output:

```
Enter the number of Requests
8
Enter the Requests sequence
95 180 34 119 11 123 62 64
Enter initial head position
50
```

```
Enter total disk size
200
Enter the head movement direction for high 1 and for low 0
1
Total head movement is 382
```

Cycle-8:

Programs on process creation and synchronization, inter process communication including shared memory, pipes, and messages. (Dinning - Philosopher problem).

C Program for IPC using pipe() function

```
#include<stdio.h>
#include<unistd.h>
#include<sys/types.h>
int main()
{
int fd[2],n;
char buffer[100];
pid_t p;
pipe(fd); //creates a unidirectional pipe with two end fd[0] and fd[1]
p=fork();
if(p>0) //parent
{
printf("Parent Passing value to child\n");
write(fd[1],"hello\n",6); //fd[1] is the write end of the pipe
}
else // child
{
printf("Child printing received value\n");
n=read(fd[0],buffer,100); //fd[0] is the read end of the pipe
write(1,buffer,n);
}
}
```

Output

Parent Passing value to child 100
Child printing received value 100

C Program for IPC using shared memory

//Program 1: Sender program : This program creates a shared memory segment, attaches itself to it and then writes some content into the shared memory segment.

```
#include<stdio.h>
#include<stdlib.h>
#include<unistd.h>
#include<sys/shm.h>
#include<string.h>
int main()
{
int i;
void *shared_memory;
char buff[100];
int shmid;
shmid=shmget((key_t)2345, 1024, 0666|IPC_CREAT); //creates shared memory segment with key 2345, having size 1024 bytes. IPC_CREAT is used to create the shared segment if it does not exist. 0666 are the permisions on the shared segment
printf("Key of shared memory is %d\n",shmid);
shared_memory=shmat(shmid,NULL,0); //process attached to shared memory segment
printf("Process attached at %p\n",shared_memory); //this prints the address where the segment is attached with this process
printf("Enter some data to write to shared memory\n");
read(0,buff,100); //get some input from user
strcpy(shared_memory,buff); //data written to shared memory
printf("You wrote : %s\n",(char *)shared_memory);
}
```

Output

```
Key of shared memory is 0
Process attached at 0x7ffe040fb000
Enter some data to write to shared memory
Hello World
You wrote : Hello World
```

//Program 2: Receiver Process : This program attaches itself to the shared memory segment created in Program 1. Finally, it reads the content of the shared memory

```
#include<stdio.h>
#include<stdlib.h>
#include<unistd.h>
#include<sys/shm.h>
#include<string.h>
int main()
{
int i;
void *shared_memory;
char buff[100];
int shmid;
shmid=shmget((key_t)2345, 1024, 0666);
printf("Key of shared memory is %d\n",shmid);
shared_memory=shmat(shmid,NULL,0); //process attached to shared memory segment
printf("Process attached at %p\n",shared_memory);
printf("Data read from shared memory is : %s\n",(char *)shared_memory);
}
```

Output

```
Key of shared memory is 0
Process attached at 0x7f76b4292000
Data read from shared memory is : Hello World
```